

PROJECT FACT SHEET

CONTRACT TITLE: Development of a 3-Component Borehole Seismic Source (PARTNERSHIP)

ID NUMBER: FEW 2836.600 B&R CODE: AC1005000	CONTRACTOR: Sandia National Laboratory ADDR: Department 6116 P.O. Box 5800 Albuquerque, NM 87185
DOE HEADQUARTERS PROGRAM MANAGER: NAME: Edith C. Allison PHONE: 202/ 586-1023 DOE PROJECT MANAGER: NAME: Purna C. Halder LOCATION: NPTO PHONE: 918/ 699-2084 E-MAIL: phalder@npto.doe.gov	CONTRACT PROJECT MANAGER: NAME: Bob Cutler PHONE: 505/ 844-5576 FAX: 505/ 844-0240 E-MAIL: rpculte@sandia.gov
PROJECT SITE CITY: Albuquerque STATE: NM CITY: La Habra STATE: CA CITY: STATE:	CONTRACT PERFORMANCE PERIOD: 9/30/1991 to 12/31/1999 PROGRAM: Supporting Research RESEARCH AREA: Partnership/Borehole Seismic Technology PRODUCT LINE: ADIS

FUNDING (1000'S)	DOE	CONTRACTOR	TOTAL
PRIOR FISCAL YRS	3162	6401	9563
FISCAL YR 1999	0	0	0
FUTURE FUNDS	0	0	0
TOTAL EST'D FUNDS	3162	6401	9563

OBJECTIVE: Develop a clamped, vibratory borehole seismic source that will provide both P- and S-waves with high output energy over a broad frequency range.

PROJECT DESCRIPTION:

Background: Crosswell seismic imaging holds great promise for providing improved description of oil reservoirs (and other geologic formations) in the region between wellbores. A primary reason why such imaging is not routinely used is the lack of borehole seismic sources and receivers which can satisfy the demands of the technology. Current seismic sources include both vibrating and impulsive types, but most suffer from one or more of the following limitations: 1) low output energy; 2) low frequency operation; 3) only one polarization output; 4) low temperature operation; or 5) difficult deployment. The advanced seismic source to be developed in this project will overcome these limitations. It will be based on hydraulic actuator technology for high output power and will utilize Sandia expertise in high temperature electronics to achieve high temperature operations. It will also provide three-component polarization output to facilitate determination of rock properties.

Work to be Performed: This project will develop current Chevron patents and borehole tool into a useful and versatile vibratory borehole seismic source. The design performance of the advanced source includes: 1) three-component output; 2) 6000 lbs force peak output; 3) 400 F, 10,000 psi capability; 4) 5-1000 Hz frequency band (goal of >1500 lbs to >600 Hz); 5) operated on a special wireline with no hoses. These features will allow crosswell seismic surveys to be used more often and will enhance their utility by providing information on all three polarization components.

PROJECT STATUS:

Current Work: Fabrication of the single axis source is complete. The source tool was loaned to Chevron for 2 years for use in several demonstration field surveys funded by industry. Initial system integration tests were conducted at Chevron's La Habra test site. Three field surveys have been conducted at Carthage, TX, Henderson, TX, and at Bayou Choctaw, LA. The data from the field tests are excellent. Some operational problems with the hardware were discovered during these tests and The data quality, the operational capability, and the ease of deployment are all greatly improved over the original Chevron prototype. Additional surveys are planned.

Scheduled Milestones:

Test Complete Single Axis Tool	02/97
Commercialize	02/97
Development of additional modules suspended until completion of field trials	06/97
Incorporate single well imaging and improved bandwidth	12/98

Accomplishments: Technical: The entire crosswell system, including seismic source, receiver array, fiber optic wirelines and trucks, uphole electronics and field data processing have all been integrated and checked out under field conditions. Minor equipment problems encountered during system start-up and field surveys are being resolved. Designs have been completed for a second vertical vibrator module for use with receivers in the same well as the source. Design of a horizontal vibrator module which can be attached to the source tool to complement the vertical vibrator are being funded by industry. Tests of the source system were conducted with clamped geophone arrays on fiber optic wirelines, long arrays of digital hydrophones, and all fiber optic hydrophones. Each of these could greatly reduce the required data acquisition time. Programmatic: A new service company, PGS/I, was formed to provide surveys with this source tool. They have conducted three commercial surveys, and have additional surveys planned. They are coordinating all of the system integration, equipment upgrades, and development of new modules, using industry funding.

The seismic source project is completed., and CRDA closeout paperwork has been submitted.

A final report, SAND98-0932 " Development of a Hydraulic borehole Seismic Source" was published and sent to wide industry distribution.